27. *(New)* A receiver front end according to claim 25 wherein the or each multifunction receiver front end MMIC has at least one of the following components:

(i) an EM wave amplifier adapted to amplify the electromagnetic wave signals received by the MMIC;

(ii) a filter adapted to filter the electromagnetic wave signals received by the MMIC;

(iii) a frequency converter adapted to convert the frequency or frequencies of the electromagnetic wave signals to a lower or higher frequency or frequencies;

(iv) a converted-signal amplifier adapted to amplify the converted signals.

28. *(New)* A receiver front end according to claim 27 wherein at least two of (i) to (iv) are provided on the same chip.

29. *(New)* A receiver front end according to claim 27 wherein at least three of (i) to (iv) are provided on the same chip.

30. *(New)* A receiver front end according to claim 27 wherein all four of (i) to (iv) are provided on the same chip.

31. *(New)* A receiver front end according to claim 30 which comprises a receiver MMIC and a doubler/buffer amplifier MMIC, and in which said receiver MMIC comprises a low noise amplifier (LNA), with a noise figure less than 4dB.

32. *(New)* A receiver front end according to claim 31 wherein said LNA is a balanced amplifier having separate amplification sections, and each electromagnetic signal received by said LNA is split into two substantially symmetric signals, each of which is fed into said separate amplification sections.

33. *(New)* A receiver front end according to claim 32 wherein each said amplification section has three stages of amplification, and the output of each said amplification section is combined, and the combined signal output from said LNA.

34. *(New)* A receiver front end according to claim 32 wherein said receiver MMIC comprises a mixer, and in which said mixer is adapted to convert the frequency of a signal output from the LNA to a lower frequency mixer output signal.

35. *(New)* A receiver front end according to claim 34 in which said mixer comprises two diodes and the signal from said LNA is fed into said diodes along with a reference signal and said diodes are adapted to multiply the signal from said LNA and said reference signal and output an output signal having a frequency equal to the difference in frequency of the signal from said LNA and the frequency of said reference signal.

36. *(New)* A receiver front end according to claim 35 wherein said mixer is a 90° balanced mixer.

37. *(New)* A receiver front end according to claim 34 wherein said receiver MMIC comprises a filter, and said filter is disposed between said LNA and said mixer, to filter the signal from said LNA before it is fed to said mixer, and wherein the passband of said filter is such that it suppresses a sideband of the signal from said LNA.

38. *(New)* A receiver front end according to claim 37 wherein said filter comprises a distributed transmission line and wherein said filter is folded into a serpentine layout.

39. *(New)* A receiver front end according to claim 31 wherein said receiver MMIC comprises an IF amplifier, and the IF amplifier is adapted to receive an IF output signal from said mixer and to amplify it to produce an IF output signal which is output from said receiver MMIC, and wherein said amplifier comprises a single transistor stage having gate and drain

terminals, and in which a parallel resistor-inductor-capacitor feedback network is applied between said gate and drain terminals of said transistor.

40. *(New)* A receiver front end according to claim 34 wherein said doubler/buffer amplifier MMIC is placed between a local oscillator, adapted to produce said reference signal, and said mixer, and the doubler/buffer amplifier MMIC receives said reference signal produced by said local oscillator and doubles the frequency of this signal producing a new reference signal which is fed to said mixer.

41. *(New)* A receiver front end according to claim 40 wherein said doubler/buffer amplifier MMIC comprises a filter component comprising two quarter wavelength open circuit stubs.

42. *(New)* A receiver front end package comprising a receiver front end according to claim 25, power supply components for said receiver front end, and connectors for said receiver and said power supply components.

43. *(New)* A receiver front end package according to claim 42 which is double sided with separate enclosures and provides isolation of said electromagnetic wave receiver front end and said power supply components into the separate enclosures, and in which connections are made between said receiver front end and said power supply components using glass bead feedthroughs in said package.

44. *(New)* A receiver front end package according to claim 42 having voltage bias lines wherein said power supply components comprise DC biasing circuits on a circuit board, and in which said biasing circuits contain bias sequencing and voltage regulation for all of the bias lines of said receiver front end.

45. *(New)* A receiver front end package according to claim 44 wherein said connectors are connected to the receiver front end using an airline launch technique with a better than 20dB impedance match of said connectors with said receiver front end.

46. *(New)* A receiver front end package according to claim 42 wherein said receiver front end package is connected to an antenna which detects the electromagnetic waves, and is bodily movable with said antenna.

47. *(New)* A receiver front end package according to claim 46 in which said receiver front end package is mounted on said antenna or a movable component thereof and can move with said antenna or component.

48. *(New)* A phased array system comprising a plurality of receiver front ends according to claim 25.

49. *(New)* A high data rate communications system comprising one or more receiver front ends according to claim 25.

50. *(New)* A receiver front end comprising:

i) a first amplifier adapted to amplify a received signal and provide an amplified signal;

ii) a filter adapted to filter said amplified signal and provide a filtered signal;

iii) a mixer adapted to take a reference signal and said filtered signal and mix them such that said mixer provides an output in a frequency range different from that of said filtered signal, so as to provide a mixed signal;

iv) a second amplifier adapted to amplify said mixed signal.

51. *(New)* A receiver front end comprising:

i) a first amplifier adapted to amplify a received signal and provide an amplified signal;

ii) a filter adapted to filter said amplified signal and provide a filtered signal;

iii) a mixer adapted to take a reference signal and said filtered signal and mix them such that said mixer provides an output in a frequency range different from that of said filtered signal, so as to provide a mixed signal;

iv) a second amplifier adapted to amplify said mixed signal; and

wherein the first amplifier comprises:

a) a first Lange coupler adapted to split the signal in first and second signals such that said first and second signals have substantially 90° phase difference;

b) a first amplification section adapted to amplify said first signal and a second amplification section adapted to amplify said second signal, said first and second amplification sections having balanced topographies, each section having first, second and third transistors and a gate and a drain bias for said transistors, said gate and drain biases being common to all the transistors; shunt resistors associated with the gate of each transistor; a series resistor-inductor-capacitor network in parallel with said section; and parallel feedback being provided across said third transistor; and

c) said first and second stages having respective outputs, and a further Lange coupler being provided so as to combine said outputs of said amplification sections.

52. *(New)* A receiver front end comprising:

i) a first amplifier adapted to amplify a received signal and provide an amplified signal;

ii) a filter adapted to filter said amplified signal and provide a filtered signal;

iii) a mixer adapted to take a reference signal and said filtered signal and mix them such that said mixer provides an output in a frequency range different from that of said filtered signal, so as to provide a mixed signal;

iv) a second amplifier adapted to amplify said mixed signal; and

wherein said mixer comprises:

a) a Lange coupler arranged such that both said reference signal and said filtered signal are added together and then separated into first and second signals with a phase difference of substantially 90°; and

b) first and second diodes, each supplied with one of said phase separated first and second signals, said first and second diodes being arranged such that said first diode is in one orientation with respect to said first input signal and said second diode is in the opposite orientation with respect to said second signal;

and arranged such that a combined output signal of said first and second diodes has a frequency substantially equal to the difference between said reference and filtered signals.

53. *(New)* A receiver front end comprising:

i) a first amplifier adapted to amplify a received signal and provide an amplified signal;

ii) a filter adapted to filter said amplified signal and provide a filtered signal;

iii) a mixer adapted to take a reference signal and said filtered signal and mix them such that said mixer provides an output in a frequency range different from that of said filtered signal, so as to provide a mixed signal;

iv) a second amplifier adapted to amplify said mixed signal; and

wherein said filter is a distributed transmission line filter, arranged in a serpentine fashion, containing quarter wave coupled elements, said filter being adapted to suppress a sideband of the output of said first amplifier.

54. *(New)* A receiver front end according to claim 53 wherein said filter is adapted to have a passband of substantially 35 GHz to substantially 40 GHz.

55. *(New)* A receiver front end comprising:

i) a first amplifier adapted to amplify a received signal and provide an amplified signal;

ii) a filter adapted to filter said amplified signal and provide a filtered signal;

iii) a mixer adapted to take a reference signal and said filtered signal and mix them such that said mixer provides an output in a frequency range different from that of said filtered signal, so as to provide a mixed signal;

iv) a second amplifier adapted to amplify said mixed signal; and

wherein said second amplifier has an output impedance and comprises a single transistor having a gate and a drain bias, a resistor-inductor-capacitor network provided between gate and drain terminals of said transistor and a resistor-capacitor network adapted to match said input impedance of the second amplifier to that required by said mixer for proper operation thereof.

56. *(New)* A receiver front end comprising:

i) a first amplifier adapted to amplify a received signal and provide an amplified signal;

ii) a filter adapted to filter said amplified signal and provide a filtered signal;

iii) a mixer adapted to take a reference signal and said filtered signal and mix them such that said mixer provides an output in a frequency range different from that of said filtered signal, so as to provide a mixed signal;

iv) a second amplifier adapted to amplify said mixed signal; and

wherein said reference signal is generated by means of a local oscillator, the output of which is used to supply a frequency doubler, the output of said doubler being passed through an amplifier before being used as said reference signal.

57. *(New)* A receiver front end comprising:

i) a first amplifier adapted to amplify a received signal and provide an amplified signal;

ii) a filter adapted to filter said amplified signal and provide a filtered signal;

iii) a mixer adapted to take a reference signal and said filtered signal and mix them such that said mixer provides an output in a frequency range different from that of said filtered signal, so as to provide a mixed signal;

iv) a second amplifier adapted to amplify said mixed signal; and

wherein the first amplifier comprises:

a) a first Lange coupler adapted to split the signal in first and second signals such that said first and second signals have substantially 90° phase difference;

b) a first amplification section adapted to amplify said first signal and a second amplification section adapted to amplify said second signal, said first and second amplification sections having balanced topographies, each section having first, second and third transistors

and a gate and a drain bias for said transistors, said gate and drain biases being common to all the transistors; shunt resistors associated with the gate of each transistor; a series resistor-inductor-capacitor network in parallel with said section, and parallel feedback being provided across said third transistor; and

c) said first and second stages having respective outputs, and a further Lange coupler being provided so as to combine said outputs of said amplification sections; and

wherein said mixer comprises:

a) a Lange coupler arranged such that both said reference signal and said filtered signal are added together and then separated into first and second signals with a phase difference of substantially 90°; and

b) first and second diodes, each supplied with one of said phase separated first and second signals, said first and second diodes being arranged such that said first diode is in one orientation with respect to said first input signal and said second diode is in the opposite orientation with respect to said second signal;

and arranged such that a combined output signal of said first and second diodes has a frequency substantially equal to the difference between said reference and filtered signals; and

wherein said filter is a distributed transmission line filter, arranged in a serpentine fashion, containing quarter wave coupled elements, said filter being adapted to suppress a sideband of the output of said first amplifier;

wherein said second amplifier has an output impedance and comprises a single transistor having a gate and a drain bias, a resistor-inductor-capacitor network provided between gate and drain terminals of said transistor and a resistor-capacitor network adapted to match said input impedance of the second amplifier to that required by said mixer for proper operation thereof; and

wherein said reference signal is generated by means of a local oscillator, the output of which is sued to supply a frequency doubler, the output of said doubler being passed through an amplifier before being used as said reference signal.